



U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

Subject: SPECIFICATION FOR L-841 AUXILIARY
RELAY CABINET ASSEMBLY FOR PILOT CONTROL
OF AIRPORT LIGHTING CIRCUITS

Date: 8/8/86

Initiated by: AAS-200

AC No: 150/5345-13A

Change:

1. PURPOSE.

a. This advisory circular (AC) contains the specification requirements for a relay cabinet used to control airfield lighting circuits. The L-841 consists of an enclosure containing a DC power supply, control circuit protection and 20 pilot relays.

b. This AC has been editorially updated for reprint/stock purposes only. There were no changes made to the content of the AC except to update related reading material and to renumber the document to AC 150/5345-13A.

2. CANCELLATION. AC 150/5345-13, Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits, dated January 6, 1964, is cancelled.

3. APPLICATION. The standards contained herein are recommended by the FAA in all applications involving airport development of this nature. The standards are mandatory for Federally-funded projects.

4. MATERIALS AND WORKMANSHIP. Materials and workmanship shall be in accordance with highest commercial standards for this type of equipment.

5. SIZE. The cabinet assembly shall be manufactured in one size adequate to accommodate the power supply, pilot relays, and accessory devices.

6. PERFORMANCE REQUIREMENTS. The assembly shall be designed for continuous indoor service at ambient temperatures ranging from -45°F. to 120°F. The assembly shall be designed for continuous operation in humid and corrosive atmospheres such as those encountered near the sea coast or refineries.

LEONARD E. MUDD

Director, Office of Airport Standards

7. DETAIL REQUIREMENTS.

- a. Enclosure. The size of the enclosure shall be sufficient to contain power supply, terminal boards, pilot relays, accessory devices,, and to provide a minimum gutter space of 4 inches on all sides. The housing of the enclosure shall be made from commercial hot galvanized or cold rolled sheet steel, 14 gauge minimum. The cover for the enclosure shall be cold rolled sheet steel, 12 gauge minimum. The housing and cover shall be cleaned and finished with 1 coat of rust-inhibiting paint and at least 1 coat of **gray** lacquer. The cover shall be attached to the housing with flush or concealed hinges, and it shall be equipped with a handle capable of locking the door in a closed position. Two keys shall ~~be~~ furnished for the lock. The enclosure ~~shall~~ be designed for surface mounting with at least 4 holes provided in the back for **1/4** inch mounting bolts. Bolts for interior equipment mounting shall not protrude through the back of the enclosure. There shall be at least 8 knockouts for 1-inch conduit on the housing. Two 1-inch knockouts shall be located on each of the 4 sides, and three **2-inch** knockouts shall be located on the bottom. A suitable ground lug, clearly marked, shall be provided either inside ~~or~~ outside the enclosure for a No. 6 AWG ground wire.
- b. DC Power Supply. The power supply shall consist of a single phase input transformer, a full wave rectifier, and necessary protective devices.
- (1) The input transformer shall be designed to supply the rectifier with adequate power to perform as specified in paragraph 7b(2) below. The transformer shall be designed for a **115-volt, 50/60-cycle** input.
 - (2) The full wave rectifier shall be designed to supply at least 48 **volts DC** at an output of 1.25 amperes, and at an ambient temperature of **120°F.** when supplied with a **115-volt, 50/60-cycle** input. The power supply shall have a no-load output voltage of less than 70 volts DC, with an input voltage of 125 volts, **50/60** cycles. The ripple content of the output voltage shall be less than **1% (500 millivolts).**
 - (3) The power supply shall have a **2-ampere** fuse connected in both-the transformer and the rectifier secondary circuits as shown in Figure 1. A suitable oil-filled capacitor and resistor shall be connected across the **DC** output of the rectifier to limit high frequency induced transients and transient switching surges across the rectifier. All components shall be rated for continuous operation at an ambient temperature of **120°F.**

c. Pilot Relays.

- (1) The pilot relays shall be the plug-in type, mounted in an accessible location. Each relay shall be furnished in a transparent dustproof enclosure.
- (2) The coil of the relay shall have a minimum resistance of 1300 **ohms**, and it shall be rated for normal operation at 48 volts **DC**. The pull-in voltage of the relay shall be 30 volts **DC**, but the relay shall be capable of operating continuously with 75 volts **DC** applied across the coil.
- (3) The relay shall have 2 sets open contacts, rated to perform 100,000 operations, making and breaking an inrush current of 10 amperes at **120 volts**, 50/60 cycles. The contacts shall also be rated to continuously carry a **4-ampere, 50/60-cycle** inductive load.
- (4) There shall be **a**0.47 microfarad, **600-volt** capacitor installed in the cabinet **across the** coil of each relay and a **100-ohm, 2-watt** resistor installed in series with each coil as shown in Figure 1.
- (5) A noncapacitive arc suppression device, suitable for installation across a **120-volt** AC circuit with lo-ampere inductive switching cycles, shall be connected across each pair **of** relay contacts. A suitable "back-to-be&k" diode assembly will be adequate for this application. **A** single polarized diode is not acceptable.
- (6) Each of the 20 relays shall have an identifying letter, 'from "A" through **"T"**, painted on the cabinet adjacent to **it for** rapid identification.

d. Terminal Boards. There shall be 2 sets of terminal boards installed inside the enclosure.

- (1) A total **of** 60 consecutive terminals shall be provided on terminal boards arranged in a **set** as shown in Figure 1. The terminal boards shall be suitable for connecting No. 19 AWG wire. The terminals shall be the screw type and rated to carry at least 2 amperes at 75 volt6 **DC**. Forty of the terminals shall be marked, in pairs, with their corresponding relay's identifying letter followed by a plus or minus sign. **For** example, the coil of relay "A" shall connect to terminals A+; A-, and **the** coil of relay B shall connect to terminals B+; B-. This system of marking shall be continued for all relays so that the coil of relay **"T"** will be connected to terminals T+; T-. The remaining 20 terminals shall be marked with numerals from "1" through **"20"**. No connections shall be made to these terminals.

(2) A second set of terminal boards consisting of 82 terminals **shall** be arranged as shown in Figure 1. The terminal boards shall be suitable for connecting No. 12 AWG wire. The terminals shall be the pressure type and rated to carry at least 10 amperes at 250 **volts** AC. One side of the terminal boards, the first 80 terminals, **shall** serve as connection points for the relay contacts,. The terminal6 shall be marked, in groups of 4, with their corresponding **relay's** identifying letter followed by the numeral "1", "2", "3", or "4". **For** example, the contacts of relay "A" **shall** connect to terminals A1, A2, A3, and A4, respectively. This system of marking shall be continued for all relays so that the contacts of relay "T" will be connected to terminals T1, T2, T3, and T4, respectively. The final 2 terminals in the set of 82 shall be marked "X1" and "X2". These terminals shall **serve** a connection point between the incoming 120-volt AC power and the input transformer.

- e. Wire and Wiring. The auxiliary relay cabinet assembly shall be completely wired at the factory with connections made to all appropriate **terminals** so that the only connections necessary in the field will be to connect the external control circuits and the **input power**. All DC wiring **shall** be at least No. 19 **AWG** plastic wire. All AC wiring shall be at least No. 12 AWG stranded, **600-volt** plastic wire. All wires shall be neatly trained and bundled with DC wiring bundled separately from AC wiring.
- f. Wiring Diagram. A wiring diagram shall be permanently mounted on the interior of the cabinet door.
- g. Relay Schedule. A relay schedule, to identify use of individual relays, ~~shall be~~ mounted on the interior of the cabinet door. The schedule ~~shall consist of 20 lines~~ marked A" through T", corresponding to the relays of the panel; with space for identifying information to be filled in, in the field. The relay schedule form may be printed on a material similar or equal to the E.L. du Pont de Nemours and Company, Incorporated's "mylar.."
- h. Code Requirements. The auxiliary relay cabinet assembly shall comply with all applicable requirements of the National Electrical Code.
- i. Parts List. A component parts **list** shall be furnished with each cabinet.
- j. Nameplate. A nameplate shall be permanently **mounted on** the outside of the auxiliary relay assembly door, and it shall contain the following information:

(1) Airport Lighting Auxiliary Relay Assembly

(2) Identification: FAA L-841

(3) Manufacturer's **Part** No. . .

(4) **Manufacturer's Name** or Trademark

- k. Optional Interlock Switch. An interlock switch shall be installed as optional equipment if specified by the user. The switch shall be designed to carry 5 **amperes at** 120 volts AC, continuously. The switch **shall also be designed** and installed so that the **120-volt** AC input **power** to the auxiliary relay cabinet will be automatically disconnected when the cabinet door is opened.

8. TESTING.

a. Qualification Testing.

- (1) Dielectric Test. All **terminals** on the terminal block shall have a potential of at least 500 volts, **r.m.s.**, 60 cycles applied for a period of one minute between the terminal and the grounded **case**. There shall be no breakdown of insulation.
- (2) Operational Test. The unit shall be energized by applying a **115-volt, 60-cycle** signal to the input terminals X1 and X2. All relay coil, terminals shall be jumpered, **simulating a** closed external control switch, and the relay's contacts shall **be checked** to determine that they are properly closed, by means of an ohmmeter or a pilot light test board. The jumpers shall then be removed, and the relays shall again be checked to determine that their contacts have properly opened.
- (3) Power Supply Tests.
 - (a) A **115-volt, 60-cycle** signal shall be connected to the input terminals X1 and X2 of **the** assembly, and all relay shall be energized. The voltage across the relay coils shall be at least 48 volts. An **oscilloscope** tracing or photograph shall be made of the DC power supply to show the output of the power supply with all relays energized, and when the input power is switched on and off, the ripple content of the DC power supply output shall be less than 1% (500 millivolts).
 - (b) A **125-volt, 60-cycle** signal shall be applied to the input terminals X1 and X2 of the assembly, and the no-load **output** voltage of the DC power supply shall be checked to determine that **it** does not exceed **70 volts DC**.
- (4) A dummy load, consisting of capacitance and resistance, shall be **connected** in the circuit with each of 2 relay coils to simulate an actual cable installation **3** miles in length. While the dummy load is connected, the relays shall be checked for proper operation when they are switched on and off. The rating of the

capacitor and resistor shall correspond to the values of capacitance and resistance encountered in 1 pair of 26 pairs No. 19 AWG telephone cable that has an average mutual capacitance of $0.083 + 0.004$ **micro-**farads per mile and a nominal DC conductor with a resistance of 42.5 ohms per mile.

(5) An inductive load with an inrush current of not less than 10 amperes shall be switched on and off while connected across a pair of relay contacts. There shall be no evidence of arcing of relay contacts.

(6) The relay contacts, with the arc suppressors installed across them, shall be checked for evidence of a capacitive effect. The contacts shall be charged for 1 minute with **120** volts AC. After the AC voltage is removed, there shall be no evidence of a potential across the relay contacts.

b. Production Testing. Each production auxiliary relay cabinet assembly shall be subjected to the tests specified in paragraphs **8a(1)** and **8a(2)**.

9. QUALIFICATION PROCEDURES. Procedures for obtaining qualification approval are contained in AC 150/5345-1, Approved Airport Lighting Equipment.

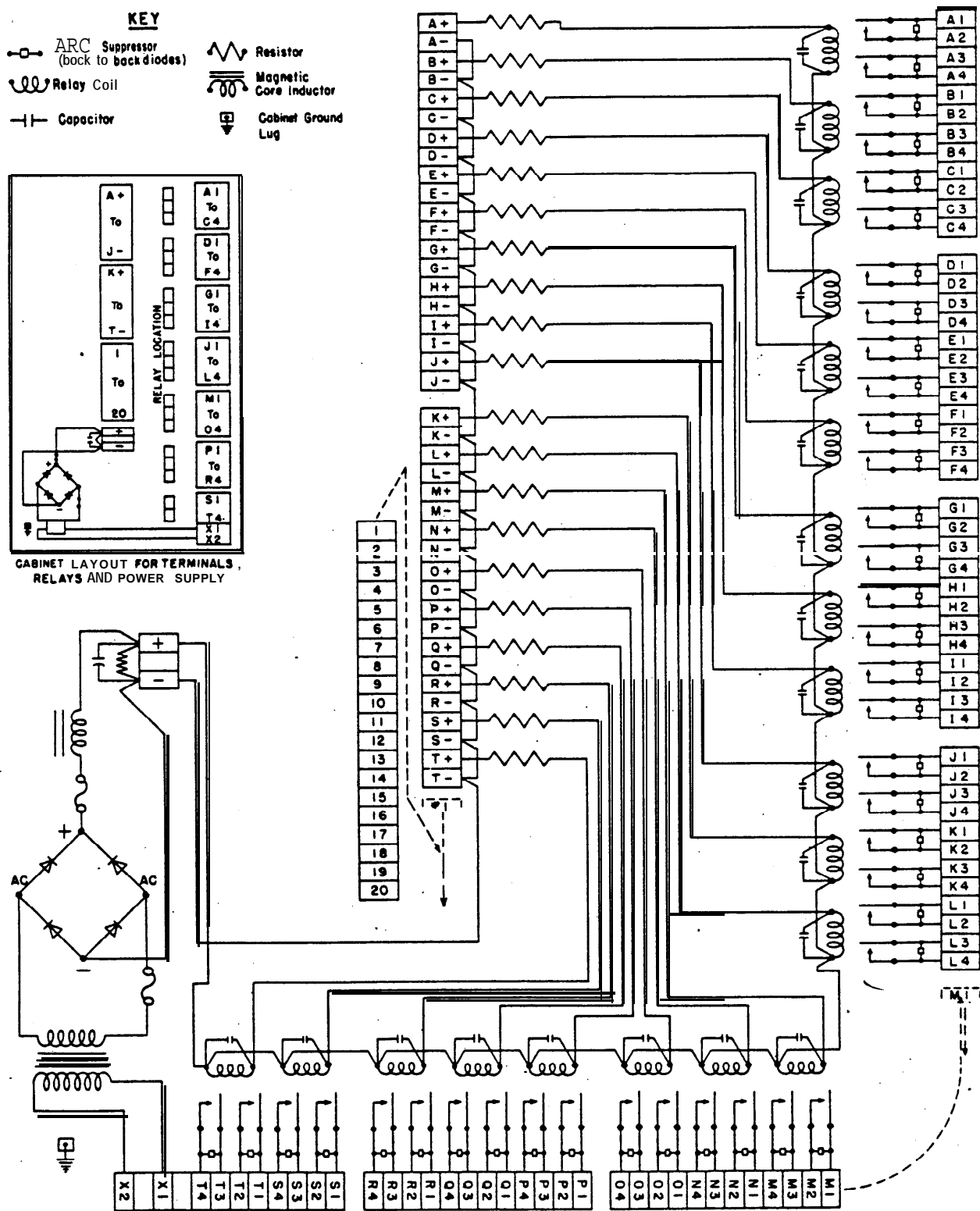


FIGURE 1. TYPICAL WIRING DIAGRAM OF L-841 RELAY ASSEMBLY